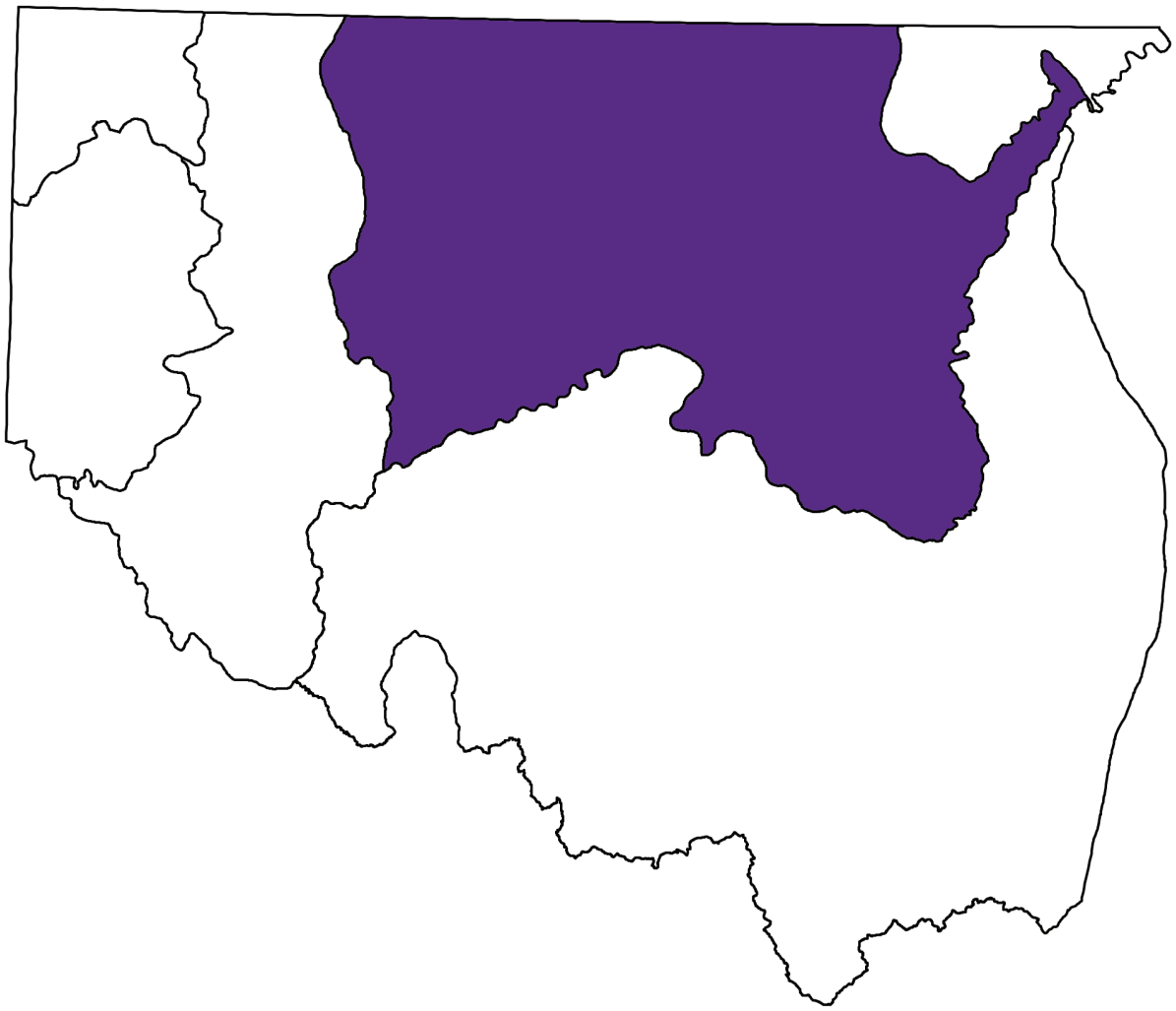
Section 6.3
Kanab Plateau Basin



6.3.1 Geography of the Kanab Plateau Basin

The Kanab Plateau Basin, located in the west central part of the planning area is 4,247 square miles in area. Geographic features and principal communities are shown on Figure 6.3-1. The basin is characterized by plateaus and canyons. Vegetation types include Mohave and Great Basin desertscrub, plains grasslands, Great Basin conifer woodland, Great Basin subalpine conifer forest and Rocky Mountain montane conifer forest. There are small areas of subalpine grassland on the Kaibab Plateau north of the North Rim, generally along Highway 67. (See Figure 6.0-9)

- Principal geographic features shown on Figure 6.3-1 are:
    - Principal basin communities of Colorado City, Fredonia, Kaibab and Moccasin
    - Other communities and places of Jacob Lake, Lees Ferry, Marble Canyon, North Rim and Toroweap Ranger Station
    - The Colorado River and Grand Canyon forming the southern basin boundary
    - A series of plateaus running north-south; the Kaibab, Kanab and Uinkaret Plateaus
    - Vermillion Cliffs in the northeast portion of the basin
    - Granite Gorge on the southeastern basin boundary
    - Antelope Valley between the Uinkaret and Kanab Plateaus
    - Point Imperial, the highest point in the basin at 8,803 feet, located east of the North Rim
- Not well shown on Figure 6.3-1 are the Hurricane Cliffs on the northwestern basin boundary and Marble Canyon on the eastern basin boundary.

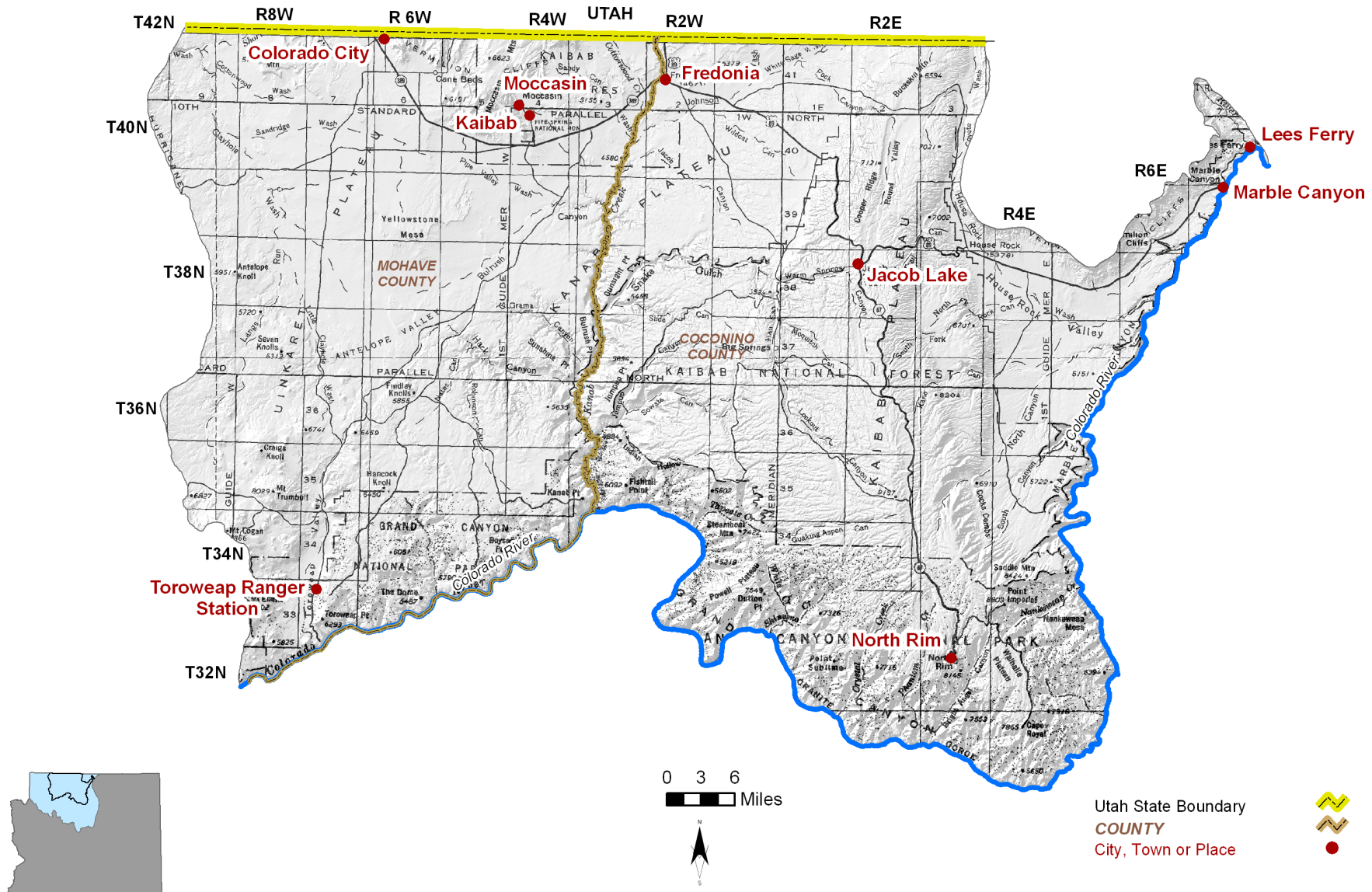


Figure 6.3-1
Kanab Plateau Basin
Geographic Features

6.3.2 Land Ownership in the Kanab Plateau Basin

Land ownership, including the percentage of ownership by category, for the Kanab Plateau Basin is shown in Figure 6.3-2. Principal features of land ownership in this basin are the large parcels of U.S. Bureau of Land Management (BLM), National Forest Service and National Park Service (NPS) lands. Three percent is managed as the Vermillion Cliffs National Monument by the BLM and 2% is managed as the Grand Canyon-Parashant National Monument by the BLM and NPS. A description of land ownership data sources and methods is found in Volume 1, Section 1.3.8. Land ownership categories are discussed below in the order of percentage from largest to smallest in the basin.

U.S. Bureau of Land Management (BLM)

- 41.6% of the land is federally owned and managed by the Arizona Strip Field Office of the Bureau of Land Management.
- BLM land in the basin includes portions of the Grand Canyon-Parashant and Vermilion Cliffs National Monuments as well as the 7,880 acre Mt. Trumbull Wilderness, 6,860 acre Cottonwood Point Wilderness and a portion of the 79,000 acre Paria Canyon Wilderness.
- Land uses include grazing, recreation and resource conservation.

National Forest and Wilderness

- 24.1% of the land is federally owned and managed as National Forest and Wilderness.
- Forest lands are part of the Kaibab National Forest and include the 40,610-acre Saddle Mountain Wilderness and the 68,340 acre Kanab Creek Wilderness.
- Land uses include recreation, resource conservation, grazing and timber production.

National Park Service (NPS)

- 22.2% of the land is federally owned and managed by the National Park Service.
- This basin includes portions of Grand Canyon National Park, Grand Canyon-Parashant National Monument and Glen Canyon National Recreation Area.
- Land uses include resource conservation and recreation.

Indian Reservation

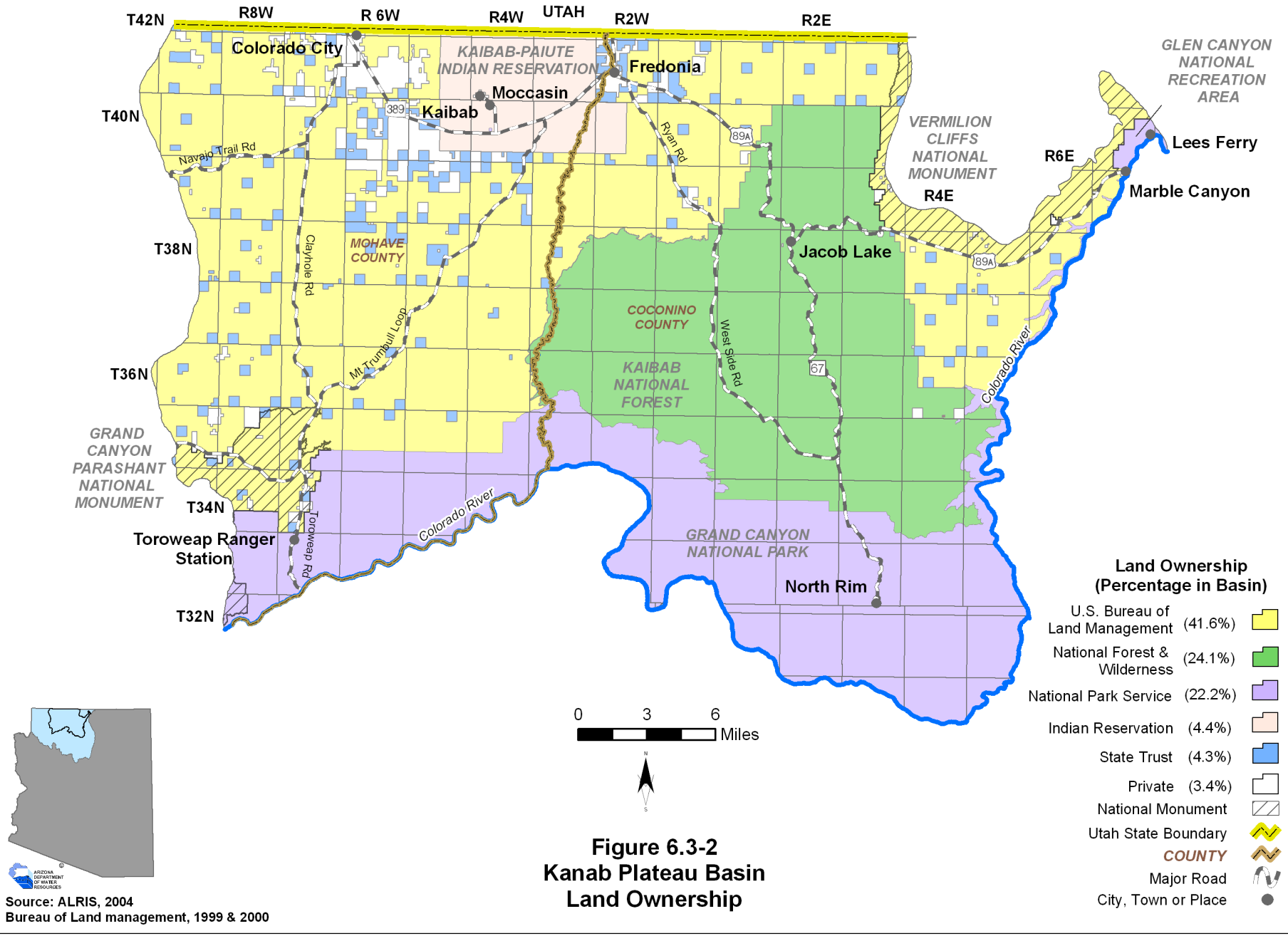
- 4.4% of the land is under tribal ownership of the Kaibab-Paiute Indian Tribe.
- Land uses include domestic, commercial, agricultural and ranching.

State Trust Land

- 4.3% of the land is held in trust for the public schools under the State Trust Land system.
- State land is located throughout the basin interspersed with BLM and private land.
- Primary land use is grazing.

Private

- 3.4% of the land is private.
- The majority of the private land is in the northern portion of the basin in the vicinity of Colorado City and Fredonia.
- Land uses include domestic, commercial, agriculture and ranching.



Source: ALRIS, 2004
Bureau of Land management, 1999 & 2000

Figure 6.3-2
Kanab Plateau Basin
Land Ownership

6.3.3 Climate of the Kanab Plateau Basin

Climate data from NOAA/NWS Co-op Network and SNOTEL/Snowcourse stations are complied in Table 6.3-1 and the locations are shown on Figure 6.3-3. Figure 6.3-3 also shows precipitation contour data from the Spatial Climate Analysis Service (SCAS) at Oregon State University. The Kanab Plateau Basin does not contain Evaporation Pan or AZMET stations. A description of the climate data sources and methods is found in Volume 1, Section 1.3.3.

NOAA/NWS Co-op Network

- Refer to Table 6.3-1A
- Temperatures at the nine NOAA/NWS Co-op Network stations range from an average annual high of 91.4°F at Phantom Ranch to an average annual low of 23.2°F at Colorado City.
- Most stations report highest average seasonal rainfall in the summer season (July-September) when about 30% of the annual rainfall occurs.
- The highest average annual precipitation is 25.70 inches at Bright Angel Ranger Station and the lowest average annual precipitation is 6.55 inches at Lees Ferry.

SNOTEL/Snowcourse

- Refer to Table 6.3-1D
- There is one SNOTEL/Snowcourse station in the basin located at the North Rim of the Grand Canyon.
- The highest average monthly snowpack is usually in March with an average of 9.9 inches of snowpack.

SCAS Precipitation Data

- See Figure 6.1-3
- Additional precipitation data shows average annual rainfall as high as 30 inches north of the North Rim and as low as four inches along the Colorado River.

Table 6.3-1 Climate Data for the Kanab Plateau Basin

A. NOAA/NWS Co-op Network:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Average Temperature Range (in F)		Average Precipitation (in inches)				
			Max/Month	Min/Month	Winter	Spring	Summer	Fall	Annual
Bright Angel Ranger Station	8,400	1971-2000	61.8/Jul	27.2/Jan	10.79	2.80	5.76	6.35	25.70
Colorado City	5,010	1971-2000	76.8/Jul	23.2/Jan, Dec	4.41	2.70	4.04	3.02	14.17
Fredonia	4,680	1948-2005[1]	74.2/Jul	32.4/Jan	2.79	1.40	2.79	3.34	10.32
Inner Canyon USGS	2,570	1948-1966	91.5/Jul	45.8/Jan	2.13	1.23	3.21	1.82	8.38
Jacob Lake	7,830	1950-1987[1]	64.9/Jul	27.9/Jan	5.71	3.64	7.08	6.67	23.10
Lees Ferry	3,210	1971-2000	87.3/Jul	37.8/Jan, Dec	1.64	0.91	2.33	1.67	6.55
Phantom Ranch	2,570	1971-2000	91.4/Jul	47.0/Jan	3.12	1.09	3.13	2.43	9.77
Pipe Springs National Monument	4,920	1971-2000	76.7/Jul	34.8/Jan	3.81	1.59	3.30	2.56	11.26
Tuweep	4,780	1948-1985[1]	79.6/Jul	38.5/Jan	3.93	1.46	3.97	2.98	12.34

Source: WRCC, 2003
Notes:
[1] Average temperature for period of record shown; average precipitation from 1971-2000

B. Evaporation Pan:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Avg. Annual Evap (in inches)
None			

Source: WRCC, 2003.

C. AZMET:

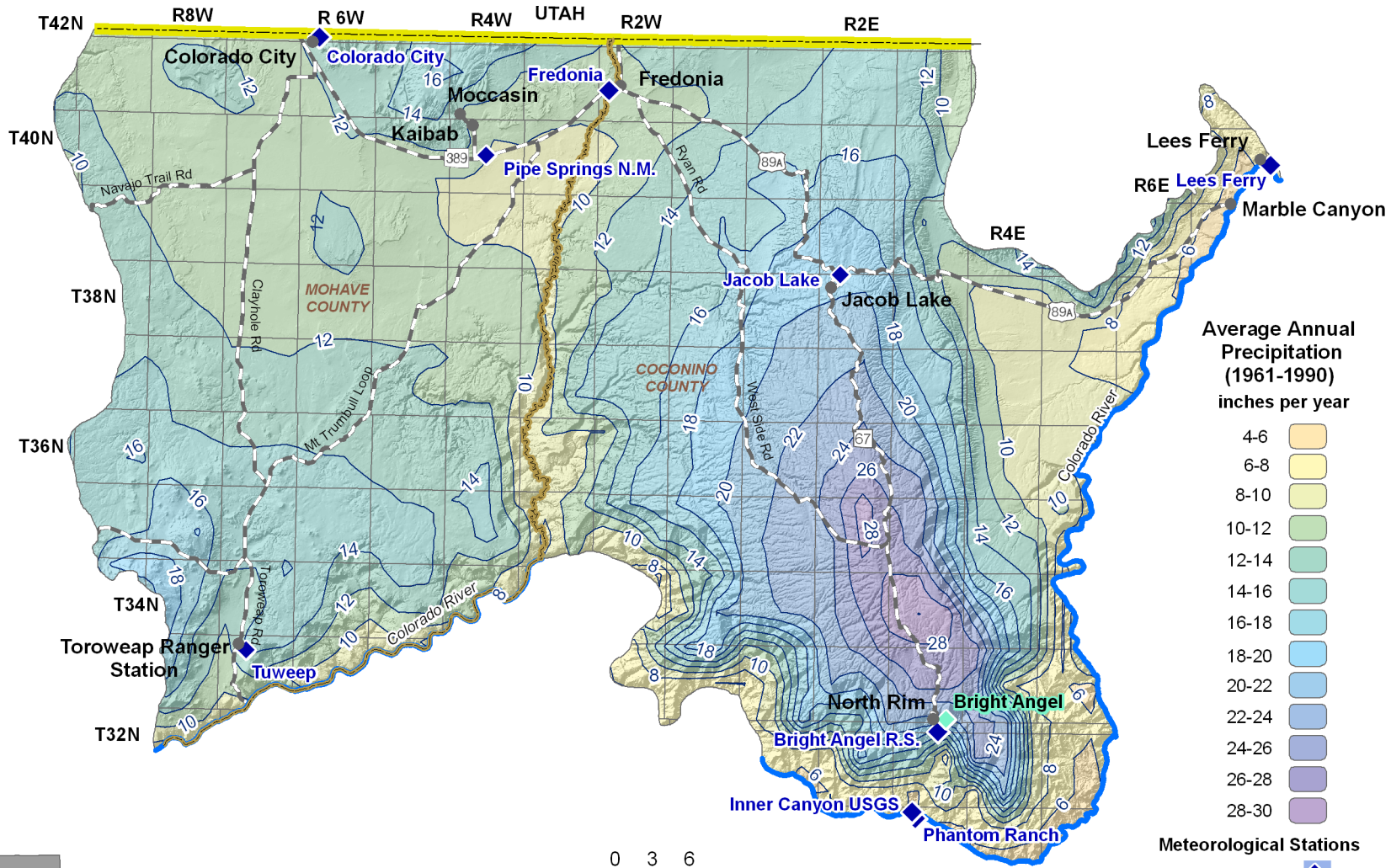
Station Name	Elevation (in feet)	Period of Record Used for Averages	Average Annual Reference Evaportranspiration, in inches (N*umber of years to calculate averages*)
None			

Source: Arizona Meteorological Network, 2005

D. SNOTEL/Snowcourse:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Average Snowpack, as Snow Water Content, at the Beginning of the Month, in Inches *(Number of measurements to calculate average)*					
			Jan.	Feb.	March	April	May	June
Bright Angel	8,400	1947 - current	3.4*(26)*	*6.9(48)*	*9.9(47)*	9.0*(42)*	16.2*(1)*	0*(0)*

Source: NRCS, 2005



Precipitation Data Source: Oregon State University, 1998

Figure 6.3-3
Kanab Plateau Basin
Meteorological Stations
and Annual Precipitation

6.3.4 Surface Water Conditions in the Kanab Plateau Basin

Streamflow data, including average seasonal flow, average annual flow and other information are shown in Table 6.3-2. Flood ALERT equipment in the basin is shown in Table 6.3-3. Reservoir and stockpond data, including maximum storage or maximum surface area, are shown in Table 6.3-4. The location of streamflow gages identified by USGS number, flood ALERT equipment, USGS runoff contours and large reservoirs are shown on Figure 6.3-5. A description of stream data sources and methods is found in Volume 1, Section 1.3.16. A description of reservoir data sources and methods is found in Volume 1, Section 1.3.11. A description of stockpond data sources and methods is found in Volume 1, Section 1.3.15.

Streamflow Data

- Refer to Table 6.3-2.
- Data from five stations located at three watercourses are shown in the table and their location is shown on Figure 6.3-4. One station has been discontinued and three stations are real-time stations.
- The Colorado River near Grand Canyon station receives highest seasonal flow in the spring (April-June) when 43% of the average annual flow occurs. Unlike the other two stations on the Colorado River in this basin, the period of record for this station predates Glen Canyon Dam upstream on the Colorado River, and therefore more closely reflects the river's unaltered average seasonal flow.
- The largest annual flow recorded in the basin is 20.6 million acre feet in 1984 at the Colorado River near Grand Canyon station with a contributing drainage area of 144,660 square miles.
- The Colorado River in the basin has a mean and median annual flow of over eight million acre-feet at all three gages. The Paria River is a major tributary to the Colorado River, with a median annual flow of over 18,000 acre-feet.
- Figure 6.3-4 shows the annual flow in the Colorado River near Grand Canyon station. Flood events/Glen Canyon Dam releases are shown in 1983-84 and in 1998. Otherwise the data show below average flow, and less variability in year-to-year flow after construction of Glen Canyon Dam in 1964. Note the very low flow in 1963-64 as the reservoir was being filled.

Flood ALERT Equipment

- Refer to Table 6.3-3.
- As of October 2005 there was one weather station in the basin located at Colorado City.

Reservoirs and Stockponds

- Refer to Table 6.3-4.
- The basin contains three large reservoirs. The largest is Fredonia, an intermittent lake, with a maximum storage capacity of 2,710 acre-feet.

- The reservoirs are used as flood control, for irrigation and for fire protection or as a stock or farm pond.
- Two of the three large reservoirs in this basin are dry or intermittent lakes.
- Surface water is stored or could be stored in ten small reservoirs.
- There are 705 registered stockponds in this basin.

Runoff Contour

- Refer to Figure 6.3-5.
- Average annual runoff is highest, two inches per year or 106 acre-feet per square mile, below the Kaibab Plateau in the western portion of the basin and decreases to 0.1 inches, or five acre-feet per square mile, east and west of the Kaibab Plateau.

Figure 6.3-4 Annual Flows (acre-feet) Colorado River near Grand Canyon 1923-2005 (Station # 9402500)

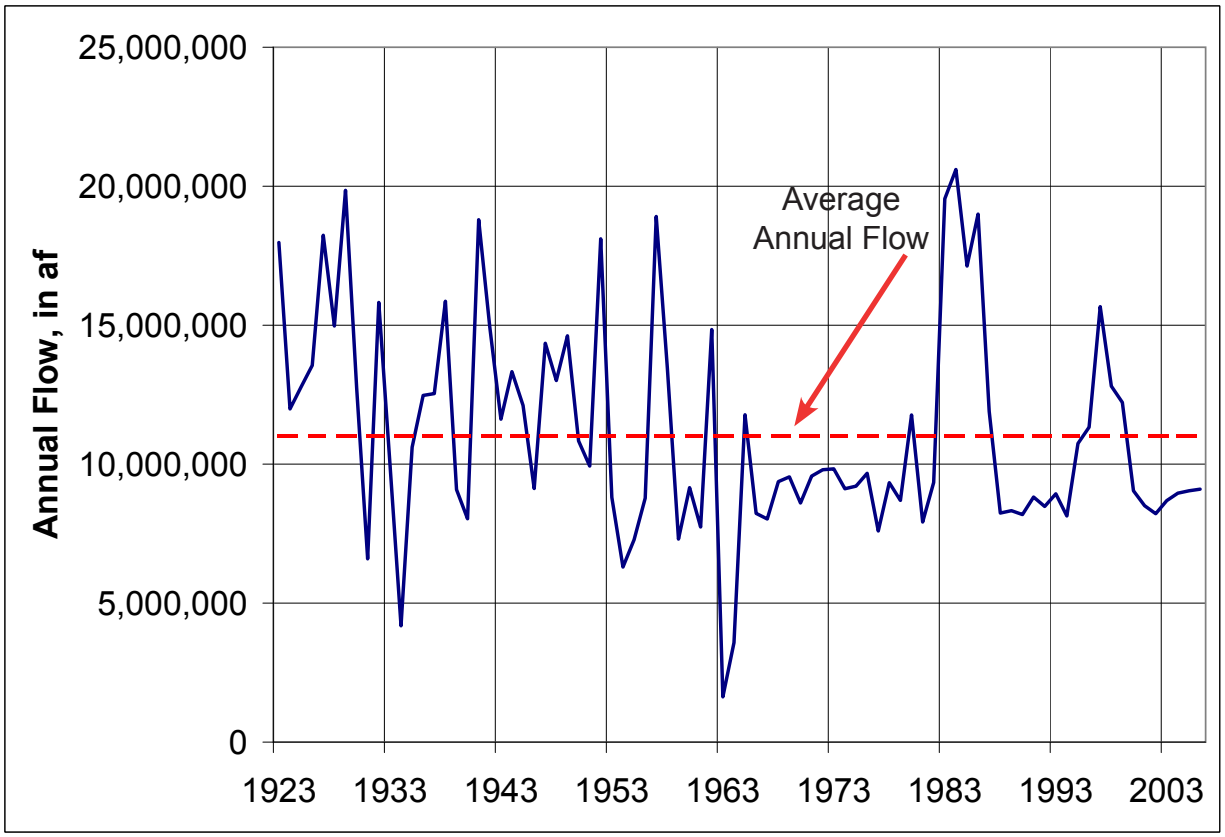


Table 6.3-2 Streamflow Data for the Kanab Plateau Basin

Station Number	USGS Station Name	Drainage Area (in mi^2)	Mean Basin Elevation (in feet)	Period of Record	Average Seasonal Flow (% of annual flow)				Annual Flow/Year (in acre-feet)				Years of Record
					Winter	Spring	Summer	Fall	Minimum	Median	Mean	Maximum	
9382000	Paria River at Lees Ferry	1,410	6,150	10/1923-current (real time)	29	11	38	22	9,052 (1977)	18,104	20,606	47,867 (1980)	79
9383000[1]	Colorado River at Compact Point near Lees Ferry	108,041	NA	10/1980-current	24	25	28	22	7,833,437 (1988)	8,383,659	9,876,067	18699615 (1986)	20
9383100	Colorado River above Little Colorado River near Desert View	114,272	NA	9/1989-9/2001 (discontinued)	25	25	27	23	8,188,186 (1990)	9,610,439	10,357,150	15,420,721 (1997)	10
9402500	Colorado River near Grand Canyon	137,641	NA	10/1922-current (real time)	17	43	24	16	1,629,360 (1963)	9,884,422	11,234,437	20,551,661 (1984)	79
9402501	Colorado River near Grand Canyon (Stonehouse)	NA	NA	11/2001-current	27	25	28	20	8,209,905 (2002)	8,466,917	8,466,917	8,723,929 (2003)	2
9403780	Kanab Creek near Fredonia	1,085	6,100	10/1963-9/1980 (discontinued)	40	27	20	14	608 (1964)	3,743	4,603	11,728 (1979)	16

Sources: USGS NWIS, USGS 1998 and USGS 2003.

Notes:
[1] This gage is also included in the Little Colorado River Basin. It is not an actual gage but a compilation of data from the Paria River gage 09392000 and the Lees Ferry gage 09380000 in the Little Colorado River Basin and is used for accounting purposes.
NA = Not available
Average seasonal flow and annual flow/year data are current as of water year 2003
Statistics based on Calendar Year
Annual Flow statistics based on monthly values
Summation of Average Annual Flows may not equal 100 due to rounding.
Period of record may not equal Year of Record used for annual Flow/Year statistics due to only using years with a 12 month record

Table 6.3-3 Flood ALERT Equipment in the Kanab Plateau Basin

Station ID	Station Name	Station Type	Install Date	Responsibility
7580	Colorado City	Weather Station	NA	Mohave County FCD

Notes:
FCD = Flood Control District
NA = Information is not available at this time

Table 6.3-4 Reservoirs and Stockponds in the Kanab Plateau Basin

A. Large Reservoirs (500 acre-feet capacity and greater)

MAP KEY	RESERVOIR/LAKE NAME *(Name of dam, if different)*	OWNER/OPERATOR	MAXIMUM STORAGE (AF)	USE[1]	JURISDICTION
1	Fredonia[2]	Fredonia	2,710	C	State

Source: U.S. Army Corps of Engineers 2005

B. Other Large Reservoirs (50 acre surface area or greater)[3]

MAP KEY	RESERVOIR/LAKE NAME *(Name of dam, if different)*	OWNER/OPERATOR	MAXIMUM SURFACE AREA (acres)	USE[1]	JURISDICTION
2	Lakes of Short Creek	Short Creek Southside Irrigation Co.	200	I	State
3	Toroweap[4]	National Park Service	83	P	Federal

C. Small Reservoirs (greater than 15 acre-feet and less than 500 acre-feet capacity)

Total number: 1
Total maximum storage: 104 acre-feet

D. Other Small Reservoirs (between 5 and 50 acres surface area)[3]

Total number: 9
Total surface area: 112 acres

E. Stockponds (up to 15 acre-feet capacity)

Total number: 705

[1] C=flood control; I=irrigation, P=fire protection, stock or farm pond
[2] Intermittent lake
[3] Capacity data not available to ADWR
[4] Dry lake

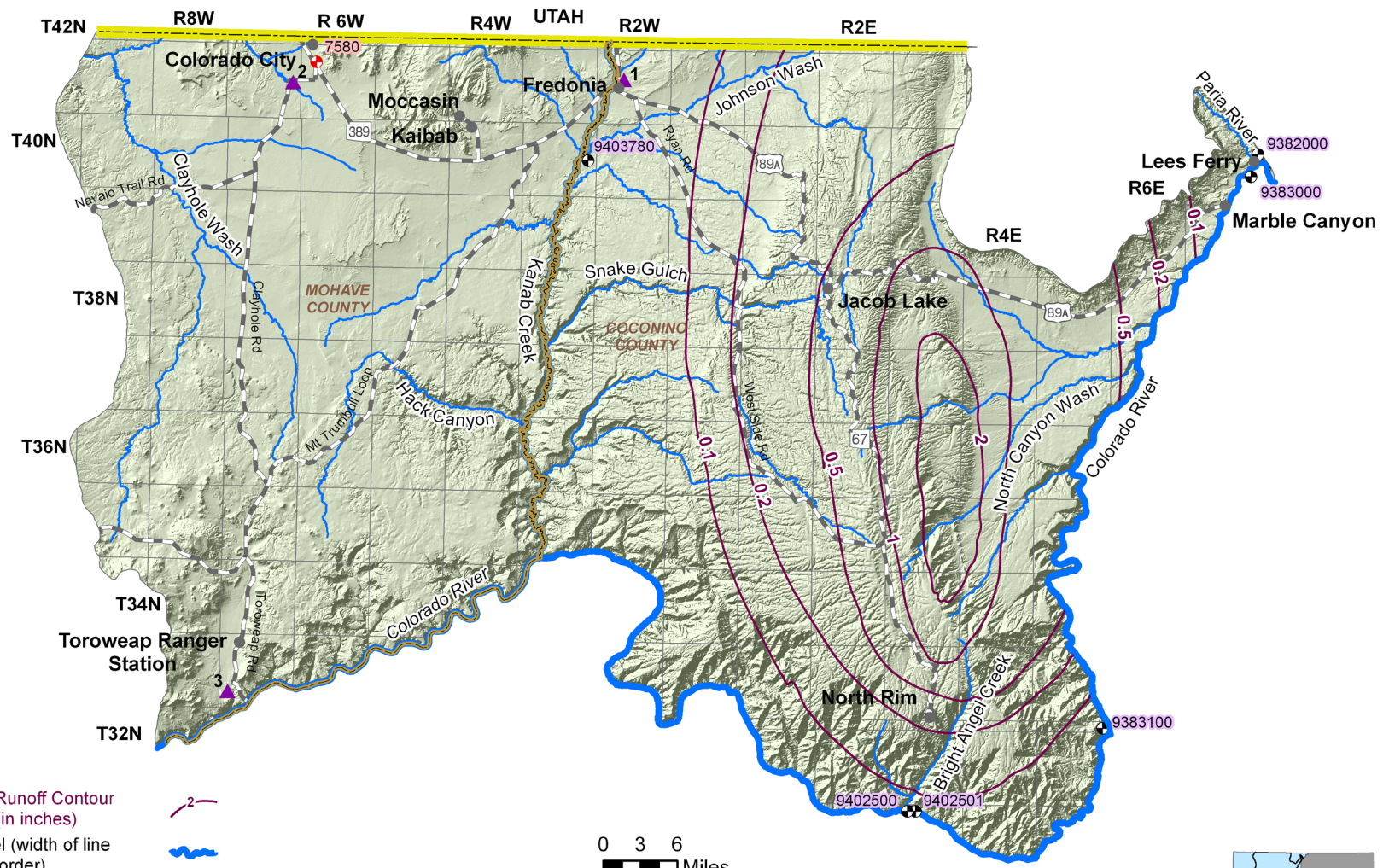


Figure 6.3-4
Kanab Plateau Basin
Surface Water Conditions

Stream Data Source: ALRIS, 2005

6.3.5 Perennial/Intermittent Streams and Major Springs in the Kanab Plateau Basin

Major and minor springs with discharge rates and date of measurement, and the total number of springs in the basin are shown in Table 6.3-5. The locations of major springs and perennial and intermittent streams are shown on Figure 6.3-6. A description of data sources and methods for intermittent and perennial reaches is found in Volume 1, Section 1.3.16. A description of spring data sources and methods is found in Volume 1, Section 1.3.14.

- The basin contains numerous perennial streams; most are located along and in the vicinity of the southern basin boundary. Significant perennial streams include the Colorado River, the Paria River and Kanab Creek.
- Intermittent streams are found south of Jacob Lake and in the vicinity of the Colorado River. Most of Kanab Creek is also intermittent in the basin.
- There are 39 major springs with a measured discharge of 10 gallons per minute (gpm) or greater at any time.
- Listed discharge rates may not be indicative of current conditions. Many of the measurements were taken during or prior to 1996.
- Most springs are located in the vicinity of the Colorado River. There is also a cluster of springs in the Moccasin/Kaibab area.
- Springs with measured discharge of 1 to 10 gpm are not mapped but coordinates are given in Table 6.3-5B. There are 23 minor springs in this basin.
- The total number of springs, regardless of discharge, identified by the USGS varies from 181 to 190, depending on the database reference.

Table 6.3-5 Springs in the Kanab Plateau Basin

A. Major Springs (10 gpm or greater):

Map Key	Name	Location		Discharge (in gpm)[1]	Date Discharge Measured
		Latitude	Longitude		
1	Tapeats (above Thunder)	362425	1122546	18,763	11/9/2003
2	Thunder at Tapeats	362346	1122728	9,741	11/9/2003
3	Angel	361317	1120040	7,810	10/14/92
4	Shinumo	361808	1121808	4,058	4/27/2002
5	Deer Creek	362322	1123027	3,542	5/31/2000
6	Roaring	361143	1120207	1,952	7/13/2003
7	Kanab Creek	362335	1123745	1,619	10/5/1993
8	Clear Creek	360454	1120208	772	4/24/2002
9	Dragon	361043	1121055	627	7/30/1969
10	Haunted	360935	1120636	430	8/15/1969
11	Abyss River	361721	1121528	403	7/13/1969
12	Fence Fault North	363139	1115044	300	3/26/2001
13	Stone Creek (below falls)	362050	1122708	265	3/1/2002
14	At Last	361716	1115745	260	7/29/1969
15	Crystal	361153	1121215	247	3/18/2004
16	Emmett[2]	361257	1120135	215	7/22/1969
17	Nankoweap Creek	361809	1115205	193	4/22/2002
18	Big	363608	1122054	185	7/2/2000
19	Ribbon[2]	361012	1120435	184	8/16/1969
20	Clear Water	364606	1123712	155	1/25/1997
21	Kwagunt Creek near Colorado R.	361542	1114948	137	10/14/1995
22	Vasey's Paradise	362957	1115126	119	3/14/2004
23	North Canyon (multiple)	362354	1120500	108	6/28/2000
24	Chuar Creek[2]	361000	1115147	100	10/12/1997
25	Long Res	365438	1124535	90	9/9/1976
26	Sand	365424	1124429	81	6/18/1997
27	Butte Fault-Upper	361658	1115318	76	3/27/2001
28	Phantom	360906	1120749	72	8/15/1969
29	Robber's Roost	361650	1120516	56[3]	7/7/1998
30	Noble[2]	361740	1121755	54	7/13/1969
31	Transcept[2]	361125	1120340	54	8/17/1969
32	Pipe	365149	1124422	35[3]	7/27/1976
33	Cottonwood	365829	1123601	25	11/15/1996
34	Mangum	363720	1122022	25	8/8/1976

Table 6.3-5 Springs in the Kanab Plateau Basin (cont'd)

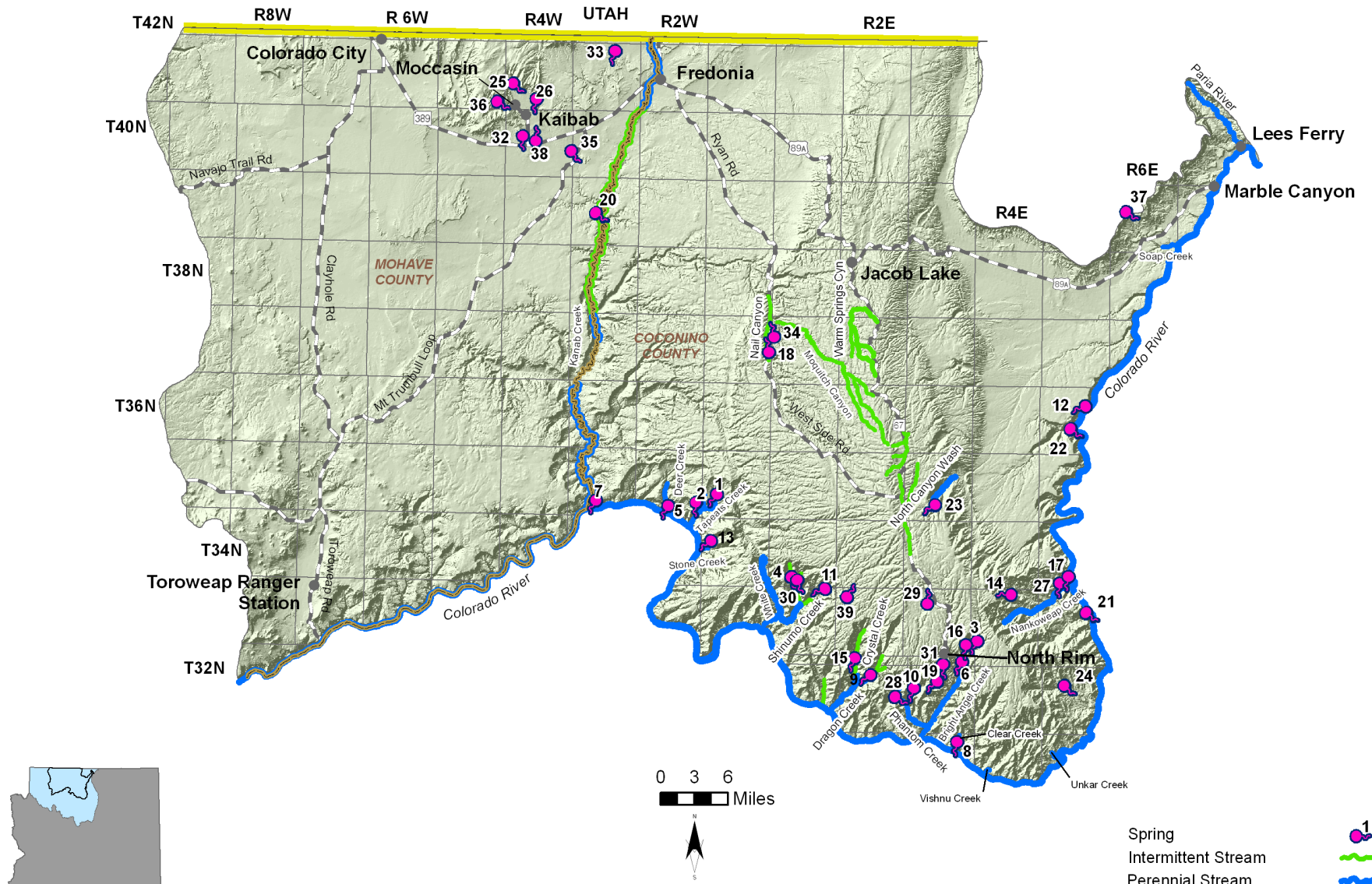
Map Key	Name	Location		Discharge (in gpm)[1]	Date Discharge Measured
		Latitude	Longitude		
35	Two Mile Seep	365047	1123942	21	11/14/1996
36	Mocassin	365437	1124546	20	During or Prior to 1997
37	Soap Creek[2]	364645	1114613	18	8/4/1976
38	Tunnel	365147	1124420	11	8/8/2000
39	Kanabownits	361714	1121246	10	6/1/1976

B. Minor Springs (1 to 10 gpm):

Name	Location		Discharge (in gpm)[1]	Date Discharge Measured
	Latitude	Longitude		
South Big	361906	1121537	9	06/1975
Sprayfield	361302	1120405	8	06/1975
Warm	364141	1121842	6	7/3/2000
Unnamed	362044	1124015	5	4/4/2001
Castle	363509	1122027	4	7/2/2000
Sowats	363139	1122718	4	7/1/2000
Cliff Dweller	361221	1120340	3	07/1976
Unnamed[2,4]	361257	1120403	3	6/1/1976
Riggs	365655	1123729	2	11/15/1996
Little	362038	1130901	2	8/16/1950
Quaking Aspen	362243	1121654	2	6/29/2000
Milk Creek	361616	1120835	2	8/5/2000
Fern Glen[2]	361543	1125503	2	5/8/1976
Nixon	362408	1130846	1	6/20/2000
Sowats B	363127	1122718	1	7/1/2000
Timp	362316	1121743	1	8/8/2000
Coyote	365707	1120203	1	8/6/1976
Watts	362247	1121631	1	6/29/2000
Wolf	365853	1123809	1	11/15/1996
Saddle Horse	361345	1130317	1	8/9/1976
Unnamed	362047	1124329	1	5/7/1976
Yellowstone	364352	1125633	1	8/15/1951
Point	365516	1124322	1	11/15/1996

C. Total number of springs, regardless of discharge, identified by USGS (see ALRIS, 2005 and NHD, 2006): 181 to 190

Notes:
[1] Most recent measurement identified by ADWR
[2] Spring is not displayed on current USGS topo map
[3] Spring flow is highly variable. Earlier measurement is shown, most recent measurement < 10gpm
[4] Location approximated by ADWR



Stream Data Source: AGFD, 1993 & 1997
Brown and Carmony, 1981

Figure 6.3-6
Kanab Plateau Basin
Perennial\Intermittent Streams
and Major (>10 gpm) Springs

6.3.6 Groundwater Conditions of the Kanab Plateau Basin

Major aquifers, well yields, number of index wells and date of last water-level sweep are shown in Table 6.3-6. Figure 6.3-7 shows water-level change between 1990-1991 and 2003-2004. Figure 6.3-8 contains hydrographs for selected wells shown on Figure 6.3-7. Figure 6.3-9 shows well yields in three yield categories. A description of aquifer data sources and methods is found in Volume 1, Section 1.3.2. A description of well data sources and methods, including water-level changes and well yields, is found in Volume 1, Section 1.3.19.

Major Aquifers

- Refer to Table 6.3-6 and Figure 6.3-7.
- Major aquifers in the basin include recent stream alluvium and sedimentary rock.
- Almost all of the basin geology consists of consolidated crystalline and sedimentary rock.
- Data on groundwater flow direction is not available for this basin.

Well Yields

- Refer to Table 6.3-6 and Figure 6.3-9.
- As shown on Figure 6.3-9, well yields in this basin range from less than 100 gallons per minute (gpm) to 1,000 gpm.
- One source of well yield information, based on 10 reported wells, indicates that the median well yield in this basin is 70 gpm.

Water Level

- Refer to Figure 6.3-7. Water levels are shown for wells measured in 2003-2004.
- The Department annually measures three index wells in this basin, two are shown on Figure 6.3-7 with hydrographs for these wells shown in Figure 6.3-8.
- For the two wells shown on Figure 6.3-7 depth to water was 87 feet at one well and 611 feet at the other. Water level change was minimal between 1990-1991 and 2003-2004.

Table 6.3-6 Groundwater Data for the Kanab Plateau Basin

Basin Area, in square miles:	4,247	
Major Aquifer(s):	**Name and/or Geologic Units**	
	Recent Stream Alluvium	
	Sedimentary Rock	
Well Yields, in gal/min:	Range 236-480 Median 358 (2 wells measured)	Measured by ADWR and/or USGS
	Range 3-500 Median 70 (10 wells reported)	Reported on registration forms for large (> 10-inch) diameter wells
	Range 30-200	ADWR (1990 and 1994)
	Range 0-500	USGS (1994)
Estimated Natural Recharge, in acre-feet/year:	N/A	
Estimated Water Currently in Storage, in acre-feet:	N/A	ADWR (1990 and 1994)
	N/A	Arizona Water Commission (1975)
Current Number of Index Wells:	3	
Date of Last Water-level Sweep:	1976 (62 wells measured)	

N/A = Not Available

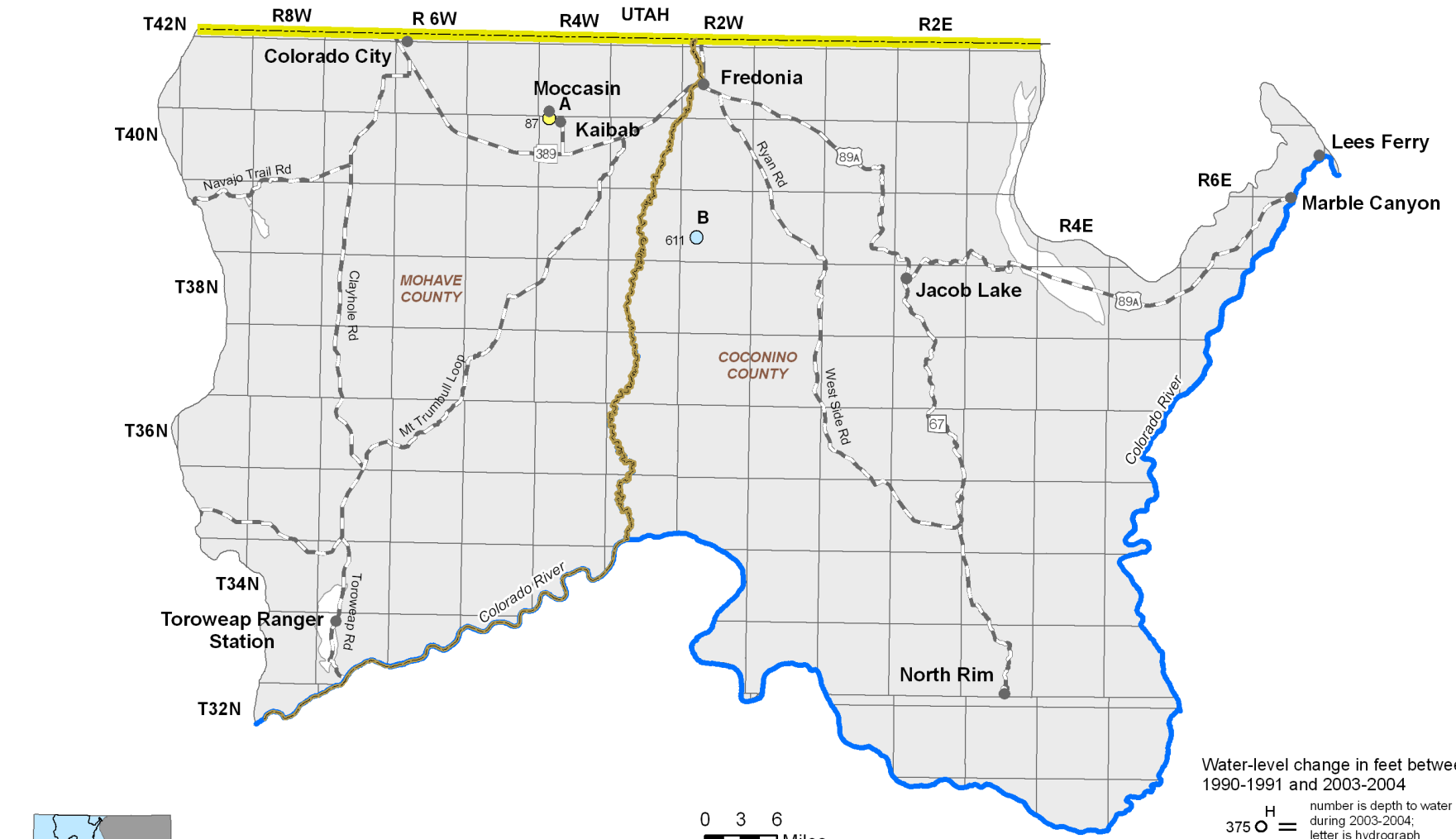
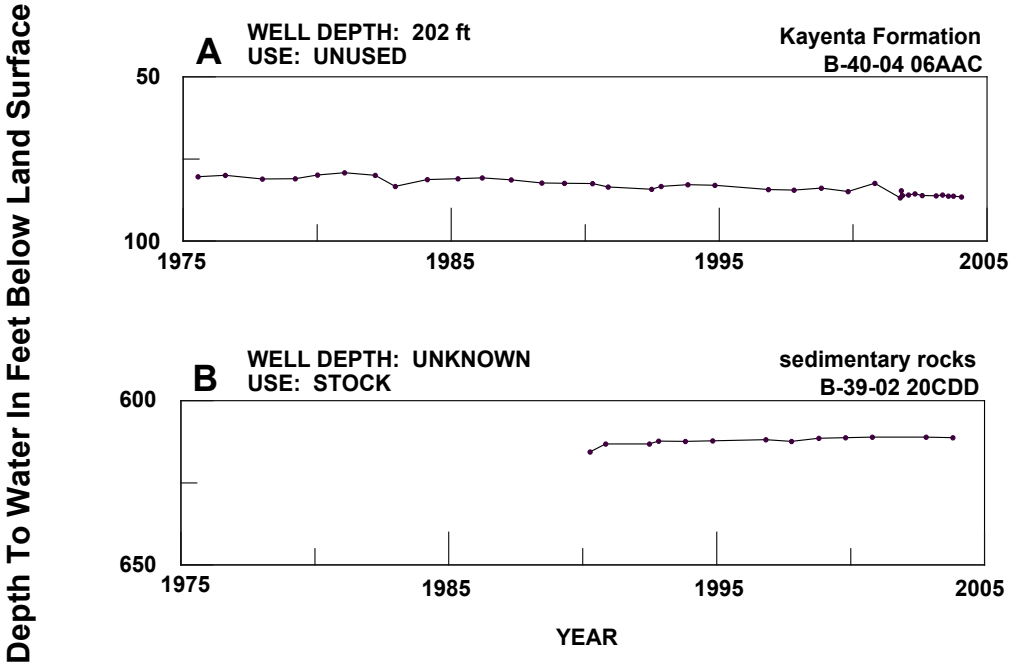


Figure 6.3-7
Kanab Plateau Basin
Groundwater Conditions

Figure 6.3-8
Kanab Plateau Basin
Hydrographs Showing Depth to Water in Selected Wells



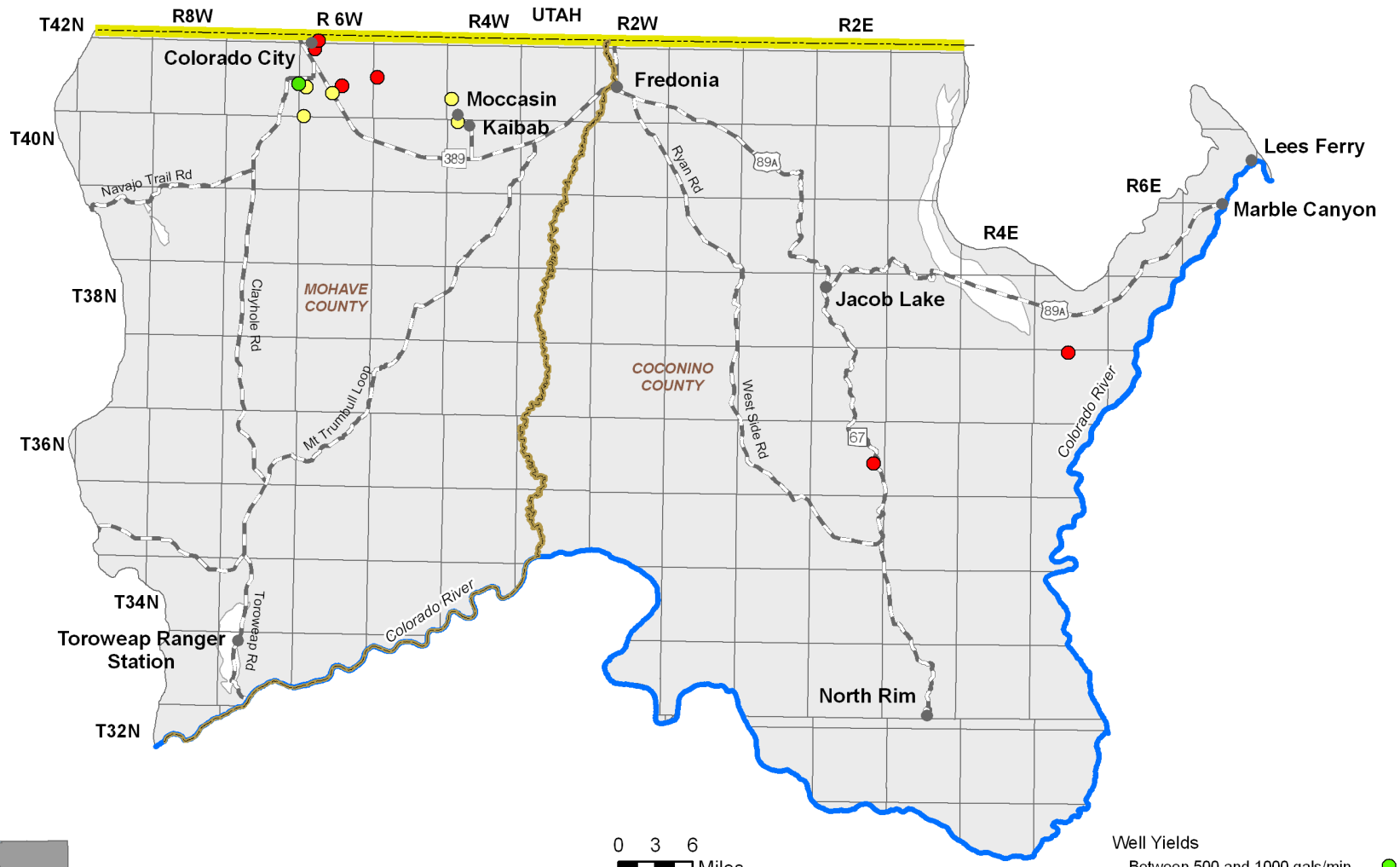


Figure 6.3-9
Kanab Plateau Basin
Well Yields

6.3.7 Water Quality of the Kanab Plateau Basin

Wells, springs and mine sites with parameter concentrations that have equaled or exceeded drinking water standard(s), including location and parameter(s) are shown in Table 6.3-7A. Impaired lakes and streams with site type, name, length of impaired reach, area of impaired lake, designated use standard and parameter(s) exceeded is shown in Table 6.3-7B. Figure 6.3-10 shows the location of water quality occurrences keyed to Table 6.3-7. A description of water quality data sources and methods is found in Volume 1, Section 1.3.18. Not all parameters were measured at all sites; selective sampling for particular constituents is common.

Wells, Springs and Mines

- Refer to Table 6.3-7A.
- Eight wells or springs have parameter concentrations that have equaled or exceeded drinking water standards.
- The parameter most frequently equaled or exceeded in the sites measured was total dissolved solids.
- Other parameters equaled or exceeded are lead and nitrates.

Lakes and Streams

- Refer to Table 6.3-7B.
- The water quality standard for suspended sediment concentration was exceeded in one 29-mile stream reach, the Paria River from the Utah border to the Colorado River. A portion of this impaired reach is located in the Paria Basin.
- This reach is not part of the ADEQ water quality improvement effort called the Total Maximum Daily Load (TMDL) Program at this time.

Effluent Dependent Reaches

- See Figure 6.3-9
- There is one effluent dependent reach in this basin, Transect Canyon. This reach receives effluent from the North Rim Wastewater Treatment Plant.

Table 6.3-7 Water Quality Exceedences in the Kanab Plateau Basin[1]

A. Wells, Springs and Mines

Map Key	Site Type	Site Location			Parameter(s) Concentration has Equaled or Exceeded Drinking Water Standard (DWS)[2]
		Township	Range	Section	
1	Well	37 North	5 East	4	TDS
2	Well	41 North	1 West	15	TDS
3	Well	41 North	4 West	31	Pb
4	Well	41 North	7 West	23	NO3
5	Spring	40 North	4 West	17	Pb
6	Well	40 North	7 West	4	TDS
7	Well	40 North	8 West	17	TDS
8	Well	39 North	4 West	24	TDS

B. Lakes and Streams

Map Key	Site Type	Site Name	Length of Impaired Stream Reach (in miles)	Area of Impaired Lake (in acres)	Designated Use Standard[3]	Parameter(s) Exceeding Use Standard[2]
a	Stream	Paria River (Utah border to Colorado River)	29[4]	NA	A&W	SSC

Notes:

NA = Not Applicable

[1] Water quality samples collected between 1976 and 2001.

[2] Pb = Lead
NO3 = Nitrate
TDS = Total Dissolved Solids
SSC = Suspended Sediment Concentration

[3] A&W = Aquatic and Wildlife

[4] Total length of the impaired reach. A portion of this reach is in the Paria Basin.

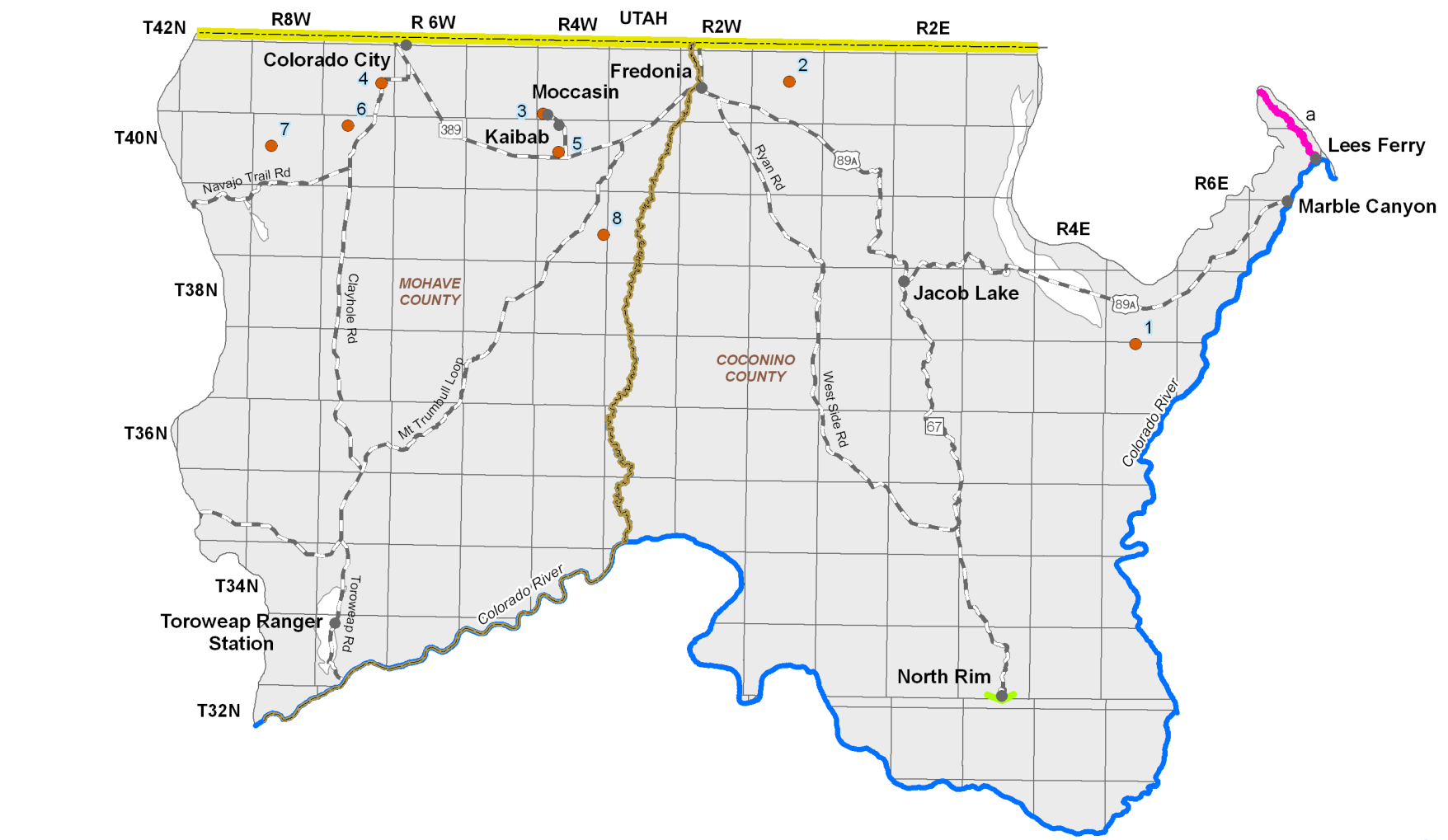


Figure 6.3-10
Kanab Plateau Basin
Water Quality Conditions

6.3.8 Cultural Water Demands in the Kanab Plateau Basin

Cultural water demand data including population, number of wells and the average well pumpage and surface water diversions by the municipal, industrial and agricultural sectors are shown in Table 6.3-8. Effluent generation including facility ownership, location, population served and not served, volume treated, disposal method and treatment level is shown in Table 6.3-9. Figure 6.3-11 shows the location of demand centers. A description of cultural water demand data sources and methods is found in Volume 1, Section 1.3.5. More detailed information on cultural water demands is found in Section 6.0.7.

Cultural Water Demands

- Refer to Table 6.3-8 and Figure 6.3-11.
- Population in this basin increased from 2,815 in 1980 to 5,930 in 2000 and is projected to reach 12,329 by 2050.
- Groundwater demand has been approximately 2,000 acre-feet per year on average from 1976-2003.
- Groundwater is used for both municipal and agricultural demand. Municipal and agricultural demand centers are located in the vicinity of Fredonia, Colorado City, Moccasin and Kaibab.
- All surface water use is for municipal demand. Data on surface water use prior to 1991 is not available. The table includes approximately 500 acre-feet of surface water that is diverted from Roaring Spring in this basin for use at the Grand Canyon South Rim in the Coconino Plateau Basin.
- As of 2007 there were no active mines in the basin. It is likely, however, that three uranium mines, Arizona One, Canyon and Pinenut will be operated in the future.
- As of 2003 there were 247 registered wells with a pumping capacity of less than or equal to 35 gallons per minute and 65 wells with a pumping capacity of more than 35 gallons per minute.

Effluent Generation

- Refer to Table 6.3-9.
- There are five wastewater treatment facilities in this basin.
- Information on population served was available for two facilities and information on effluent generation was available for four facilities. These facilities serve over 2,900 people and generate over 400 acre-feet of effluent per year. In the past Colorado City operated a wastewater treatment facility that served over 5,000 people and generated 403 acre-feet per year. The plant closed in 2002 and Colorado City now sends sewage to Hildale, Utah for treatment.
- Of the five facilities with information on the effluent disposal method: one discharges to evaporation ponds; two discharge for irrigation; and one discharges to unlined impoundments that recharge the aquifer.

Table 6.3-8 Cultural Water Demands in the Kanab Plateau Basin [1]

Year	Recent (Census) and Projected (DES) Population	Number of Registered Water Supply Wells Drilled		Average Annual Demand (in acre-feet)						Data Source
				Well Pumpage			Surface-Water Diversions			
		Q ≤ 35 gpm	Q > 35 gpm	Municipal	Industrial	Irrigation	Municipal[2]	Industrial	Irrigation	
1971		171[3]	50[3]	<500			NR[4]			ADWR (1994)
1972										
1973										
1974										
1975										
1976				2,000			NR			
1977										
1978										
1979										
1980	2,815									
1981	2,985	6	5	2,000			NR			
1982	3,155									
1983	3,324									
1984	3,494									
1985	3,664									
1986	3,834	18	6	2,000			NR			
1987	4,004									
1988	4,174									
1989	4,343									
1990	4,513									
1991	4,655	10	1	800	NR	1,500	900	NR	<1,000	USGS (2005) ADWR (2005)
1992	4,797									
1993	4,938									
1994	5,080									
1995	5,222									
1996	5,364	23	1	1,000	NR	1,500	900	NR	<1,000	
1997	5,505									
1998	5,647									
1999	5,789									
2000	5,930									
2001	6,156	5	2	1,000	NR	<1,000	900	NR	<1,000	
2002	6,382									
2003	6,608									
2010	8,190									
2020	9,476									
2030	10,570									
2040	11,463									
2050	12,329									
ADDITIONAL WELLS:[5]		**14**								
WELL TOTALS:		**247**	**65**							

[1] Does not include evaporation losses from stockponds and reservoirs.

[2] Surface water diverted in the Kanab Plateau Basin is delivered to the Coconino Plateau Basin for use at the Grand Canyon South Rim.

[3] Includes all wells through 1980.

[4] Surface water diversions for irrigation occurred in the Fredonia area prior to 1990 however data on the volume of surface water diversions is not available.

[5] Other water-supply wells are listed in the ADWR Well Registry for this basin, but they do not have completion dates. These wells are summed here.
NR - Not reported

Table 6.3-9 Effluent Generation in the Kanab Plateau Basin

Facility Name	Ownership	City/Location Served	Population Served	Volume Treated /Generated (acre-feet)	Disposal Method								Current Treatment Level	Population Not Served	Year of Record
					Water-course	Evaporation Pond	Irrigation	Wildlife Area	Golf Course	Municipal Reuse	Discharged to Another Facility	Infiltration Basins			
Fredonia WWTF	Fredonia	Fredonia	1,395	157		X							Secondary w/ Nutrient Removal	1,025	1998
Jacob Lake	Private	Jacob Lake	NA												
Kaibab Lagoons	NA	NA	1,500	168								X	Secondary	NA	2000
North Rim-Grand Cayon WWTP	National Park Service	Park	NA	112	Trancept Canyon		X						NA		2002
Phantom Ranch	National Park Service	Park	NA	10			X						NA		2002
Total			2,895	447											

NA: Data not currently available to ADWR
WWTF: Waste Water Treatment Facility
WWTP: Waste Water Treatment Plant

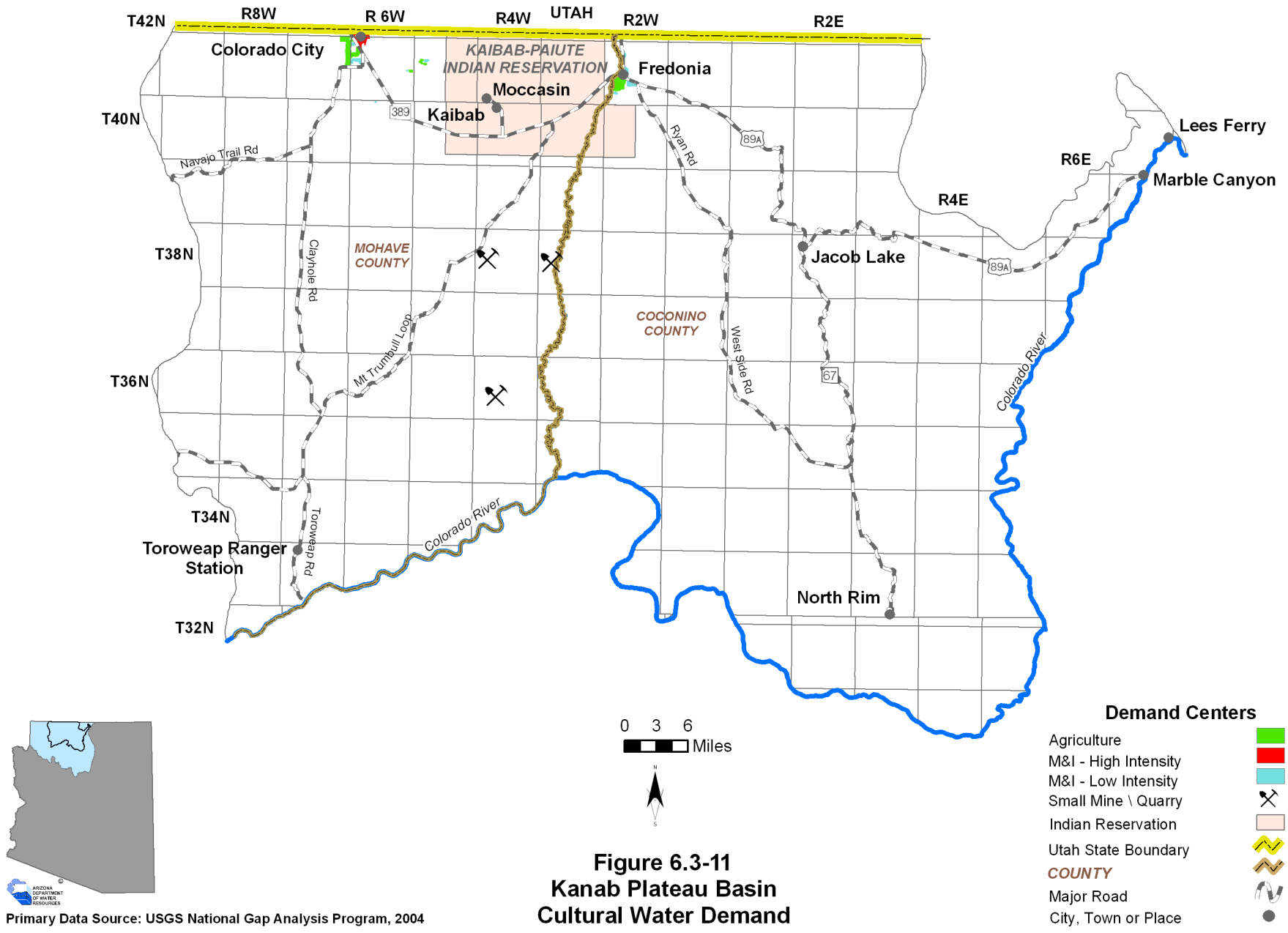


Figure 6.3-11
Kanab Plateau Basin
Cultural Water Demand

6.3.9 Water Adequacy Determinations in the Kanab Plateau Basin

Water adequacy determination information including the subdivision name, location, number of lots, adequacy determination, reason for the inadequacy determination, date of determination and subdivision water provider are shown in Table 6.3-10. Figure 6.3-12 shows the locations of subdivisions keyed to the Table. A description of the Water Adequacy Program is found in Volume 1, Appendix A. Adequacy determination data sources and methods are found in Volume 1, Sections 1.3.1.

Water Adequacy Reports

- See Table 6.3-10
- Six of the nine water adequacy determinations made in this basin through May, 2005 were determinations of inadequacy.
- Most of the inadequacy determinations were because the applicant chose not to submit the necessary information, and/or the available hydrologic data was insufficient to make a determination.
- The number of lots receiving a water adequacy determination, by county, are:

County	Number of Subdivision Lots	Number of Lots Determined to be Adequate	Percent Adequate
Coconino County	229	70	31%
Mohave County	131	131	100%

Table 6.3-10. Adequacy Determinations in the Kanab Plateau Basin[1]

Map Key	Subdivision Name	County	Location			No. of Lots	ADWR File No.[2]	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination[3]	Date of Determination	Water Provider at Time of Application
			Township	Range	Section						
1	Centennial Park Unit 1	Mohave	41 North	6 West	18	66	22-300320	Adequate		08/16/99	Centennial Park Utilities
2	Cliff Dweller's Homelands	Coconino	39 North	6 East	28, 33	6		Inadequate	A1	07/11/88	Dry Lot Subdivision
3	Cowboy Butte Estates	Coconino	41 North	2 West	5, 8	13		Inadequate	A1	06/23/88	Town of Fredonia
4	Gateway Mobile Home Park	Mohave	41 North	2 West	17, 21	65		Adequate		03/17/78	Town of Fredonia
5	Gateway Mobile Park	Coconino	41 North	2 West	17	70		Inadequate	A1, B	4/24/1986	Town of Fredonia
6	Heaton Subdivision	Coconino	41 North	2 West	16	28		Inadequate	A1	03/18/85	Town of Fredonia
7	Lewis Estates Subdivision	Coconino	41 North	2 West	16, 21	16	22-400613	Inadequate	C	10/29/01	Town of Fredonia
8	Roadrunner Estates	Coconino	41 North	2 West	20	26		Inadequate	A1	03/26/84	Town of Fredonia
9	Shiprock Estates	Coconino	41 North	2 West	17, 21	70		Adequate		03/17/78	Town of Fredonia

Notes:

[1] Each determination of the adequacy of water supplies available to a subdivision is based on the information available to ADWR and the standards of review and policies in effect at the time the determination was made. In some cases, ADWR might make a different determination if a similar application were submitted today, based on the hydrologic data and other information currently available, as well as current rules and policies.

[2] Prior to February 1995, ADWR did not assign file numbers to applications for adequacy determination.

[3] A. Physical/Continuous
1) Insufficient Data (applicant chose not to submit necessary information, and/or available hydrologic data insufficient to make determination)
2) Insufficient Supply (existing water supply unreliable or physically unavailable;for groundwater, depth-to-water exceeds criteria)
3) Insufficient Infrastructure (distribution system is insufficient to meet demands or applicant proposed water hauling)
B. Legal (applicant failed to demonstrate a legal right to use the water or failed to demonstrate the provider's legal authority to serve the subdivision)
C. Water Quality
D. Unable to locate records

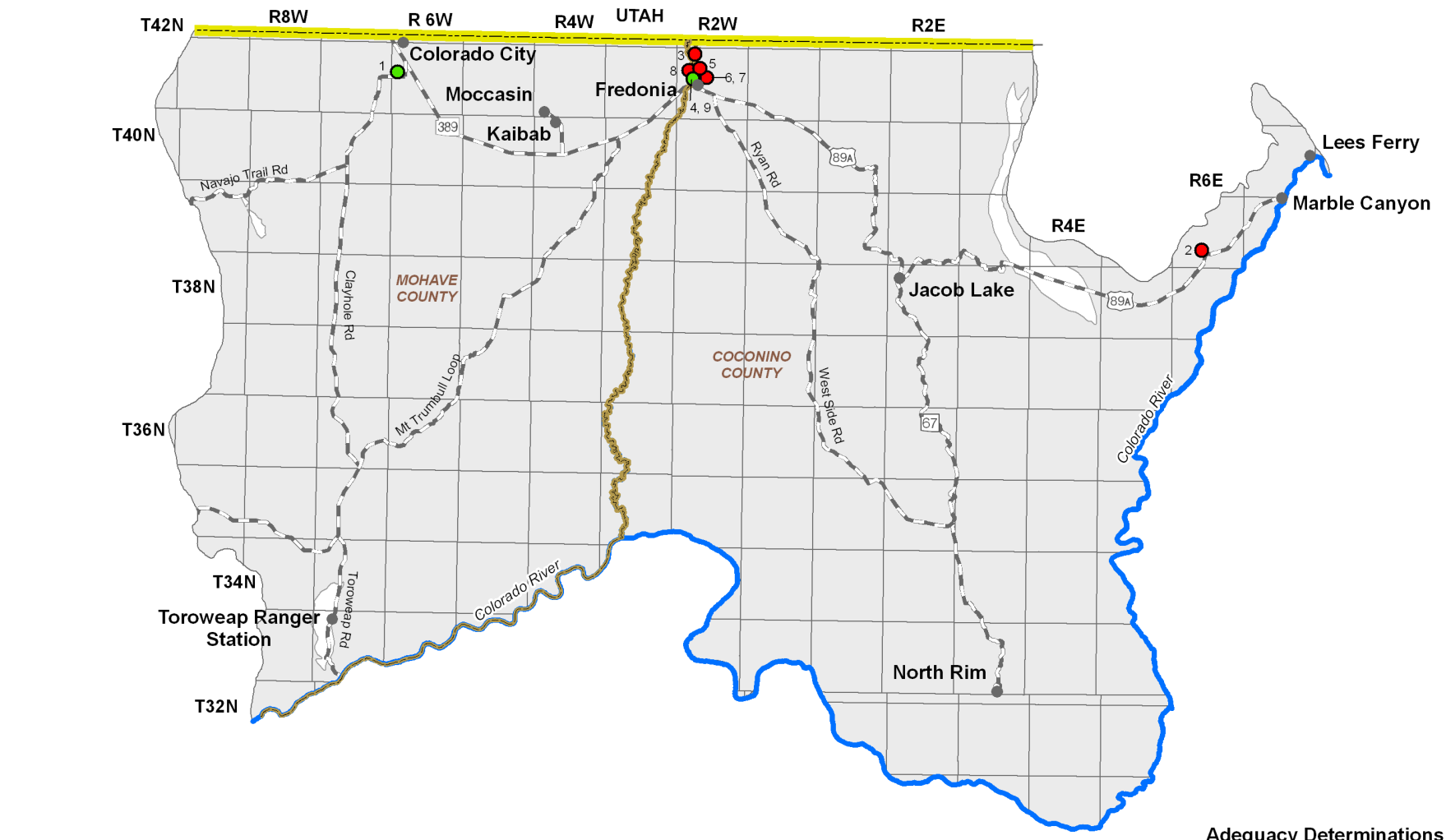


Figure 6.3-12
Kanab Plateau Basin
Adequacy Determinations

Kanab Plateau Basin
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